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Chapter 3.0

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Ozone Concentrations

As described in Chapter 1, continuous O_3 concentrations were monitored throughout 1998 at a height of 10 m at 76 CASTNet sites. Based on the CASTNet siting criteria, the O_3 measurements are generally considered regionally representative and, therefore, are able to define geographic patterns of rural O_3 across most of the United States. This section provides information on hourly and 8-hour concentrations and SUM06 values collected in 1998 and also information on trends in 8-hour concentrations and SUM06 over the 10-year period 1989 through 1998.

Hourly Concentrations

Figure 3-1 shows the number of days with hourly O_3 concentrations greater than or equal to 125 ppb in 1998. Seven eastern sites and one western site experienced days with measured 1-hour O_3 levels equal to or greater than 125 ppb. The eastern sites include Acadia National Park, ME (ACA416), Abington, CT (ABT147), Beltsville, MD (BEL116), Shenandoah National Park, VA (SHN418), Great Smoky Mountains National Park at Look Rock, TN (GRS420), Georgia Station, GA (GAS153), and Unionville, MI (UVL124). Beltsville, the only suburban site of the five, experienced 5 days with high concentrations. The two eastern national park sites are forested, rural locations. The other five sites are considered agricultural although all five are relatively close to major metropolitan areas. Joshua Tree National Monument in California (JOT403) had 9 days with measured high 1-hour concentrations. JOT403 is a high elevation site downwind of the Los Angeles basin.

Eight-Hour Concentrations

Figure 3-2 provides fourth-highest daily maximum 8-hour O_3 concentrations measured in 1998. Approximately 70 percent of the eastern and California sites have 8-hour concentrations above 85 ppb. Eight sites measured concentrations equal to or greater than 100 ppb. The highest 8-hour concentration was measured at JOT403 and GRS420. Lower 8-hour concentrations were measured at sites distant from major source regions.

SUM06

SUM06 is a measure of exposure of vegetation and crops to O_3 during the growing season. EPA had proposed SUM06 as a secondary standard with a numerical limit of 25 ppm-hours (ppm-hr). Although EPA concluded that an 8-hour limit of 0.08 ppm was an appropriate level for a secondary standard, SUM06 provides an alternate statistical indicator of O_3 impact on vegetation and crops. SUM06 is calculated as the sum of hourly O_3 concentrations above 0.06 ppm summed over 12 hours (8 AM to 8 PM) during a 3-month period.

Figure 3-3 shows peak SUM06 values for 1998. The peak values were taken as the maximum rolling 3-month SUM06 at each CASTNet site. A majority of CASTNet sites measured SUM06 above 25 ppm-hr.

Ten-Year Trends

Figure 3-4 presents the 10-year trend in the fourth-highest daily maximum 8-hour O_3 concentrations aggregated over the selected 34-station subset. The intersite variability is shown graphically by the 90th percentile, median, composite mean, and 10th percentile. Figure 3-5 shows the 10-year trend in peak SUM06 values from the 34 stations. The figure shows considerable yearly variability with high composite SUM06 values during 1991, 1995, and 1998. Relatively high O_3 concentrations were measured in these three years, which were hot and dry and considered photochemically active years.

A comparison of Figures 3-4 and 3-5 shows good agreement between fourth-highest 8-hour values and SUM06 as indicators of O_3 trends. Figure 3-6, which provides a scattergram of fourth-highest 8-hour and SUM06 values, corroborates the agreement and supports the use of 8-hour values to depict O_3 trends and exposures.

Figure 3-1. Number of Days with Hourly O_3 Concentrations Greater than or Equal to 125 ppb for 1998

Figure 3-2. Fourth Highest Daily Maximum 8-Hour O_3 Values for 1998

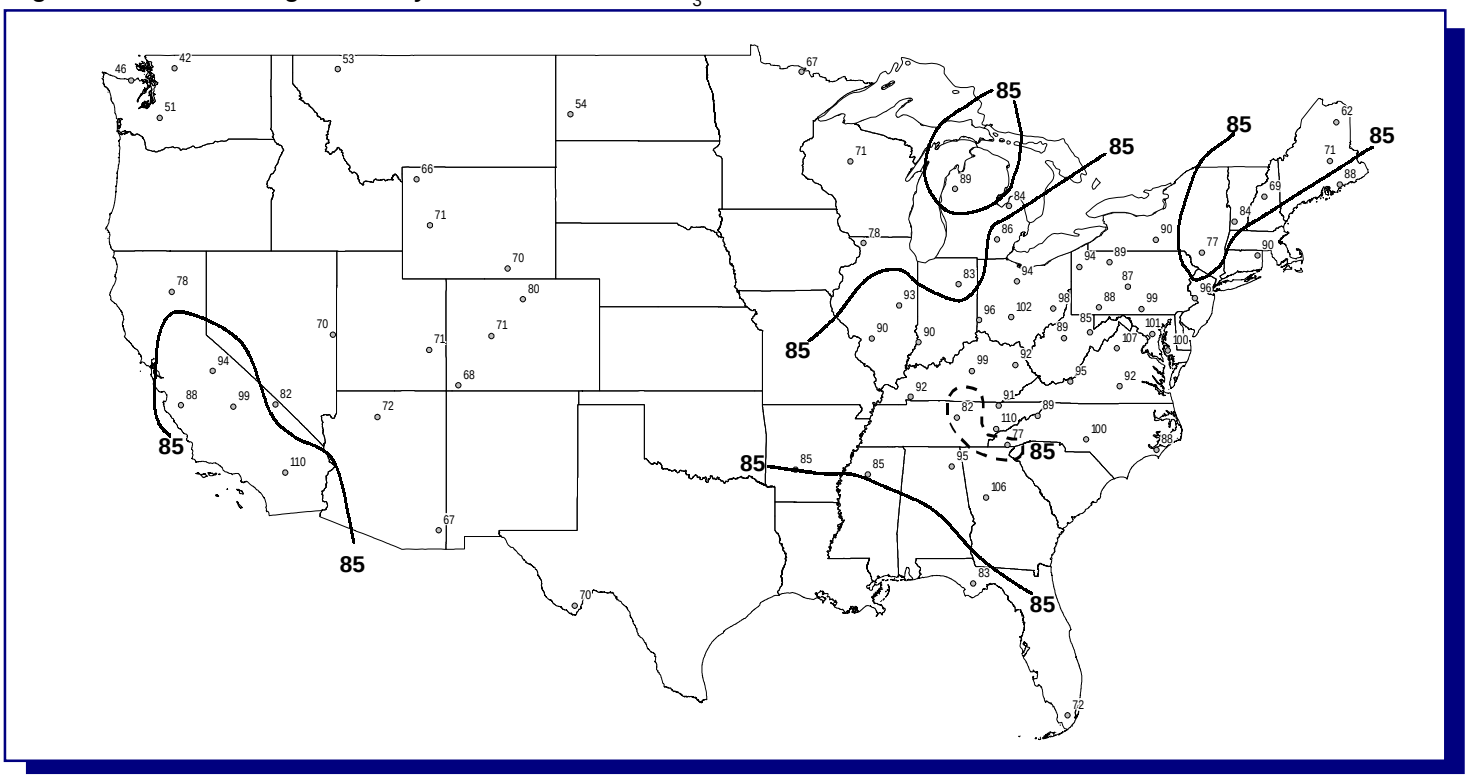

Figure 3-3. 1998 SUM06 Values (ppm-hr)

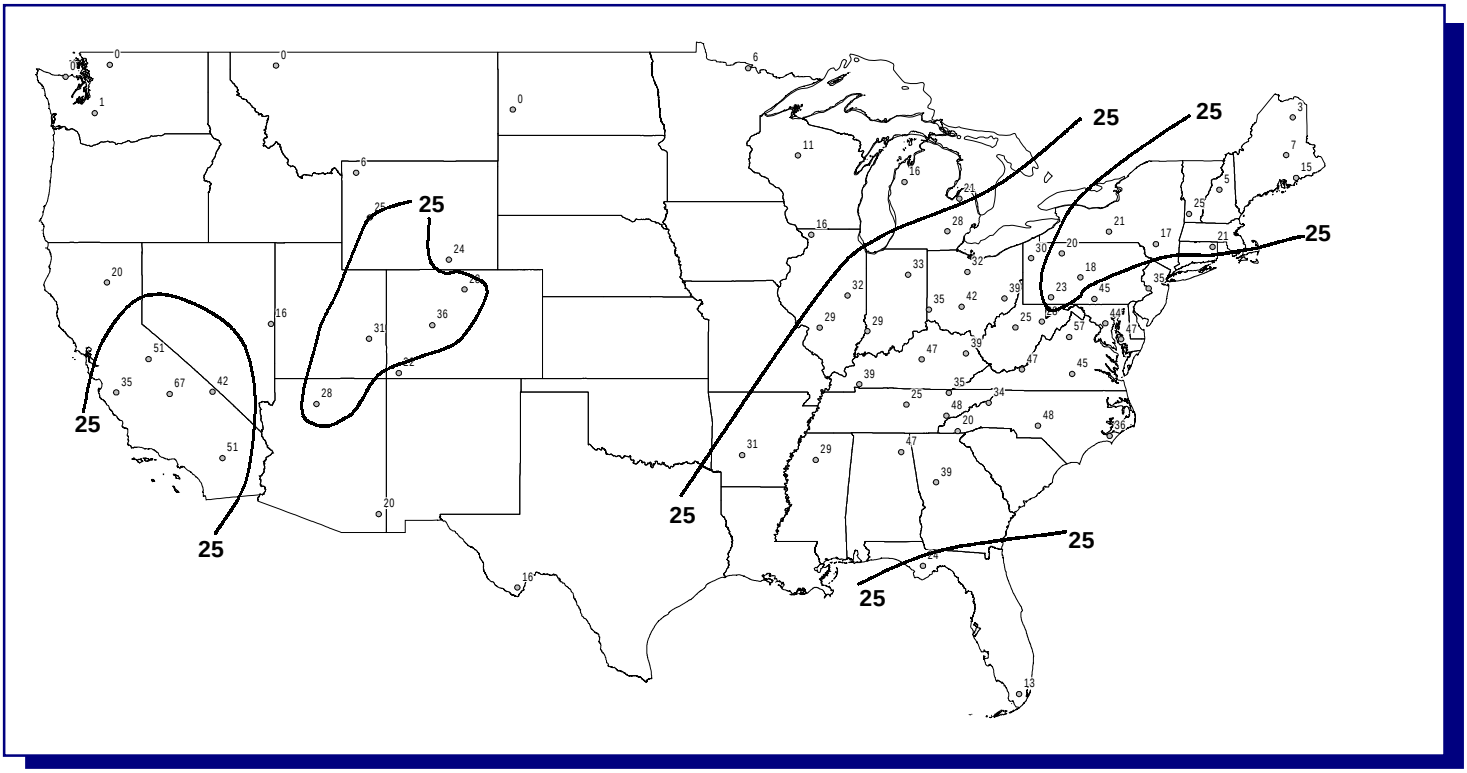

Figure 3-4. Trends in Composite Fourth Highest Daily Maximum 8-Hour O_3 Values

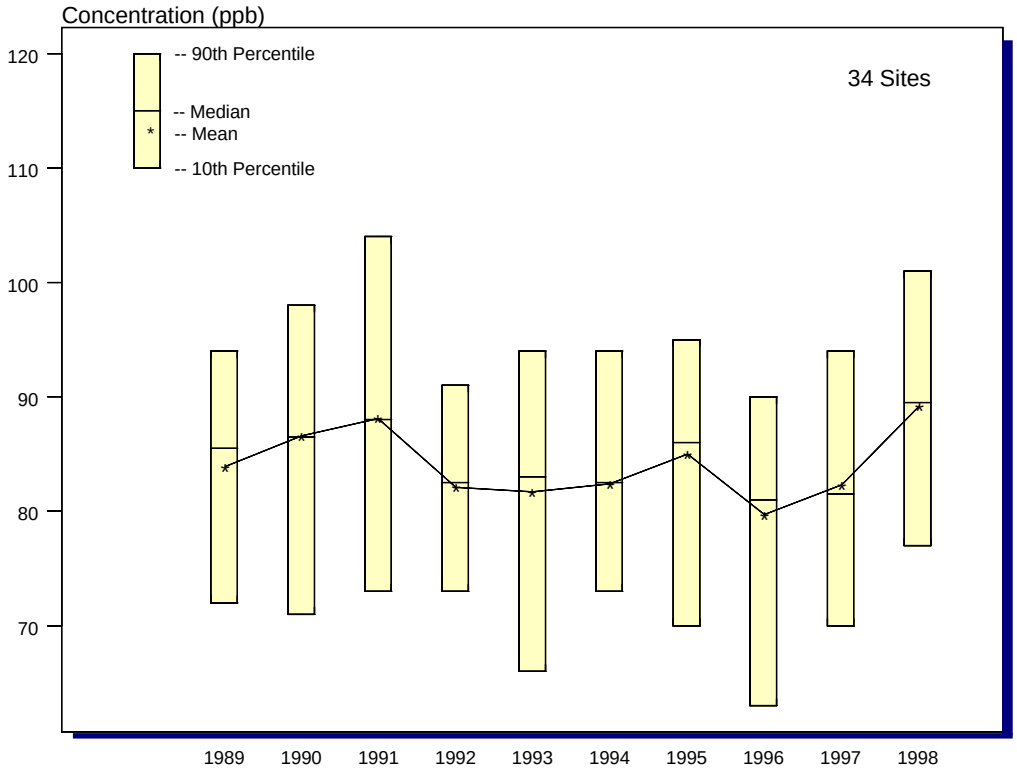

Figure 3-5. Trends in Composite SUM06 Values

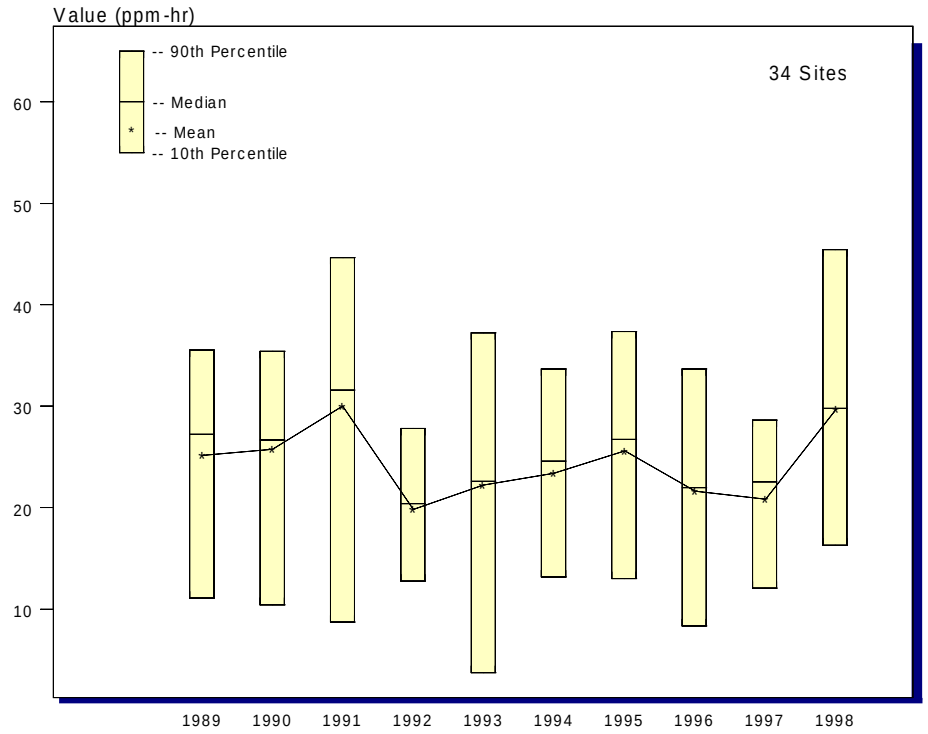

Figure 3-6. Scatterplot of Fourth-Highest 8-Hour Ozone Concentrations (ppb) and SUM06 (ppm-hr) Values (1989-1998)